

REMARKS

Claims 2-6 and 8-12 remain pending in the application. Claims 2 and 8 are hereby amended. No new matter is being added.

As a preliminary matter, the applicants respectfully thank the Examiner for admitting that his prior understanding of the previously presented claims was incorrect. As discussed further below, applicants respectfully submit that, while the cited art may be in the same general field, none of the cited art discloses the problem addressed by the claimed invention, much less the innovative solution as claimed.

Claim Rejections—35 U.S.C. § 101

Applicants have hereby amended claims 2 and 8 to recite that the steps are performed by a temporal filtering apparatus. Such an apparatus is shown in Fig. 12 and described on page 16, line 25 through page 17, line 6 of the present application. Claims 3-5 and 9-12 depend on claims 2 and 8, respectively. Claim 6 was already an apparatus claim.

Therefore, applicants respectfully submit that this rejection is now overcome by the claims.

Claim Rejections—35 U.S.C. § 103

*A. Rejection of claims 2-4, 6 and 8-11 under 35 U.S.C. § 103 as being unpatentable over Kalivas et al. in view of Prakash et al.*

Claims 2-4

Previously-presented claim 2 recites as follows.

2. A method for temporally filtering a video sequence, the method comprising:

using object motion estimation for arbitrarily shaped segments to align corresponding pixels between at least two frames;

**determining segments that are no longer adjacent to a segment boundary based on said object motion estimation;**

**reducing impact of color blur from said segments that are no longer adjacent by adjusting weights assigned to one or more frames for pixels that lie within a blur region near said segment boundary; and**

computing a weighted average of color values of said corresponding pixels.

(Emphasis added.)

As shown above, claim 2 recites both “determining segments that are no longer adjacent to a segment boundary based on said object motion estimation” and “reducing impact of color blur from said segments that are no longer adjacent by adjusting weights assigned to one or more frames for pixels that lie within a blur region near said segment boundary.”

(i) ***“determining segments that are no longer adjacent to a segment boundary based on said object motion estimation”***

First, the latest office action asserts that the **newly-exposed** or “previously-hidden regions” of Prakash et al. read upon the claimed “segments that are **no longer adjacent** to a segment boundary.” (Latest office action, page 4, line 16 through page 5, line 2, emphasis added.) Applicants respectfully disagree with this assertion as factually incorrect.

Applicants respectfully submit that **newly-exposed** regions per Prakash et al. **do not even exist in prior frames**. Hence, these regions are referred to as

newly exposed. As these newly-exposed regions did not even exist in prior frames, applicants do not understand how these newly-exposed regions could possibly be “segments that are **no longer adjacent** to a segment boundary.”

The Examiner contends that “Interior portions of these previously-hidden regions that are ‘no longer adjacent to a segment boundary’, or the new boundary between the previously-hidden region and another object.” (Latest office action, page 4, line 20 through page 5, line 2.) However, this contention does not make sense. This is because a previously-hidden region per Prakash et al. **is actually adjacent** to the boundary in a current frame. Hence, the previously-hidden region cannot qualify as “no longer adjacent.”

- (ii) ***“reducing impact of color blur from said segments that are no longer adjacent by adjusting weights assigned to one or more frames for pixels that lie within a blur region near said segment boundary”***

Second, there is no disclosure or suggestion in Kalivas et al. or Prakash et al. of even the *problem* being solved by the claimed invention, much less the solution provided by the claimed invention.

The problem being solved by the claimed invention is “reducing impact of color blur from said segments that are **no longer adjacent**.” In other words, color may bleed or blur from one segment to an adjacent segment in a prior frame, and that color bleed or blur may still be present in a current frame even though the segments are no longer adjacent. (Application, page 12, lines 11-19.)

In relation to this problem, the Examiner cites to section 4 of Kalivas et al. However, section 4 of Kalivas et al. relates to “edge preserving motion compensated image sequence enhancement” in which the blurring of the edge of a moving object is reduced. Section 4 of Kalivas et al. does not disclose or suggest the problem of color bleed or blur from “segments that are **no longer adjacent**”.

The solution provided by the claimed invention is “by adjusting weights assigned to one or more frames for pixels that lie within a blur region near said segment boundary.” As admitted by the Examiner in the latest office action, Kalivas et al. teaches against the claimed solution by setting “ $\lambda=1$  for all pixels in moving objects and  $\lambda=0$  for all pixels in the background.” (Latest office action, page 5, line 20 through page 6, line 1.) In other words, *no weight adjustment near the segment boundary is disclosed or suggested by Kalivas et al.*

In regard to Prakash et al., the latest office action cites to the “previously-hidden regions” in Prakash et al. as being “segments that are no longer adjacent.” However, as discussed above, *the previously-hidden regions in Prakash et al. cannot read on “segments that are no longer adjacent.”* Hence, any encoding done by Prakash et al. of the previously-hidden regions is irrelevant to this claim.

For at least the above-discussed reasons, applicants respectfully submit that claim 2 overcomes this rejection.

Claims 3-4 depend from claim 2. Hence, claims 3-4 also overcome this rejection.

#### Claim 6

Claim 6 recites as follows.

6. An apparatus for temporally filtering a video sequence, wherein object motion estimation for arbitrarily shaped segments is used to align corresponding pixels between at least two frames and to **determine segments that are no longer adjacent to a segment boundary**, wherein **weights assigned to one or more frames are adjusted for pixels that lie within a blur region near said segment boundary to reduce impact of color blur from said segments that are**

**no longer adjacent to said segment boundary**, and wherein said apparatus computes a weighted average of color values of said corresponding pixels.

(Emphasis added.)

As seen above, apparatus claim 6 recites limitations similar to the limitations discussed above in relation to claim 2. Hence, applicants respectfully submit that claim 6 also overcomes this rejection for at least the same reasons.

#### Claims 8-11

Claim 8 recites as follows.

8. A method for temporally filtering a video sequence using motion compensation, the method being performed by a temporal filtering apparatus and comprising:

- estimating motion of objects between frames in the video sequence;
- aligning pixels from a current frame with matching pixels from select neighboring frames according to the estimated motion of a surrounding object;
- calculating a weighted average of the aligned pixels for each pixel in the current frame to produce a filtered version of the current frame; and

- adjusting weights used to calculate the weighted average in order to compensate for blur transitions near object boundaries due to temporal changes in adjacent objects.**

(Emphasis added.)

As seen above, claim 8 recites “adjusting weights used to calculate the weighted average in order to compensate for blur transitions near object

boundaries due to temporal changes in adjacent objects.” The term “temporal changes in adjacent objects” in claim 8 relates to the “segments that are no longer adjacent” in claim 2. The term “adjusting weights used to calculate the weighted average in order to compensate for blur transitions near object boundaries...” in claim 8 relates to the “reducing impact of color blur ... by adjusting weights ...” in claim 2. Thus, applicants respectfully submit that claim 8 also overcomes this rejection for similar reasons as discussed above in relation to claim 2.

Claims 9-11 depend from claim 8. Hence, claims 9-11 also overcome this rejection.

*B. Rejection of claims 5 and 12 under 35 U.S.C. § 103 as being unpatentable over Kalivas et al. in view of Prakash et al. and further in view Golin*

Claims 5 and 12 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kalivas et al. in view of Prakash et al. and further in view of Golin. Both rejections rely on Kalivas et al. in view of Prakash et al. Applicants respectfully traverse both these rejections.

Claim 5 depends on claim 2. The disclosure of Golin does not cure the deficiencies of Kalivas et al. and Prakash et al. discussed in relation to claim 2. Therefore, applicants respectfully submit that claim 5 overcomes this rejection.

Claim 12 depends on claim 8. The disclosure of Golin does not cure the deficiencies of Kalivas et al. and Prakash et al. discussed in relation to claim 8. Therefore, applicants respectfully submit that claim 12 overcomes this rejection.

*C. Rejection of claim 3 under 35 U.S.C. § 103 as being unpatentable over Kalivas et al. in view of Prakash et al.*

In addition to claim 3 being patentable due to its dependency on claim 2, claim 3 also recites the additional limitation of “setting the weight for one or more

**past** frames to zero for pixels that lie within a newly exposed area.” (Emphasis added.)

In other words, a current frame may have a newly exposed area. There are pixels that lie within the newly exposed area for the current frame. **This limitation sets weights to zero for those pixels, not in the current frame, but rather in past frames.**

The citation to Prakash et al. discloses that, if newly exposed pixels are determined to be background residue, then setting those pixels in a current frame to zero. This is entirely different to the step in claim 3 as it does not go back and change weightings in a past frame, as claimed.

For this additional reason, applicants respectfully submit that claim 3 further overcomes its rejection.

*D. Rejection of claim 10 under 35 U.S.C. § 103 as being unpatentable over Kalivas et al. in view of Prakash et al.*

In addition to claim 10 being patentable due to its dependency on claim 8, claim 10 also recites the additional limitation that “the adjustment of weights comprises a reduction of a weight multiplier in a blur region between converging objects.”

In other words, when two objects are converging in that they are moving together in a series of frames, then this claim adjusts a weight multiplier in a region between those converging objects.

The citation against this limitation in claim 10 is merely to “a local residue” in Prakash et al. Applicants respectfully submit that there is no reasoning given as to how mere disclosure of the term “local residue” could possibly read on the limitation of claim 10 which recites that “the adjustment of weights comprises a reduction of a weight multiplier in a blur region between converging objects.”

For this additional reason, applicants respectfully submit that claim 10 further overcomes its rejection.

Conclusion

For the above discussed reasons, applicants respectfully request withdrawal of the rejections of the latest office action.

The Examiner is invited to call the undersigned for any questions. Favorable action is respectfully solicited.

Respectfully submitted,

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